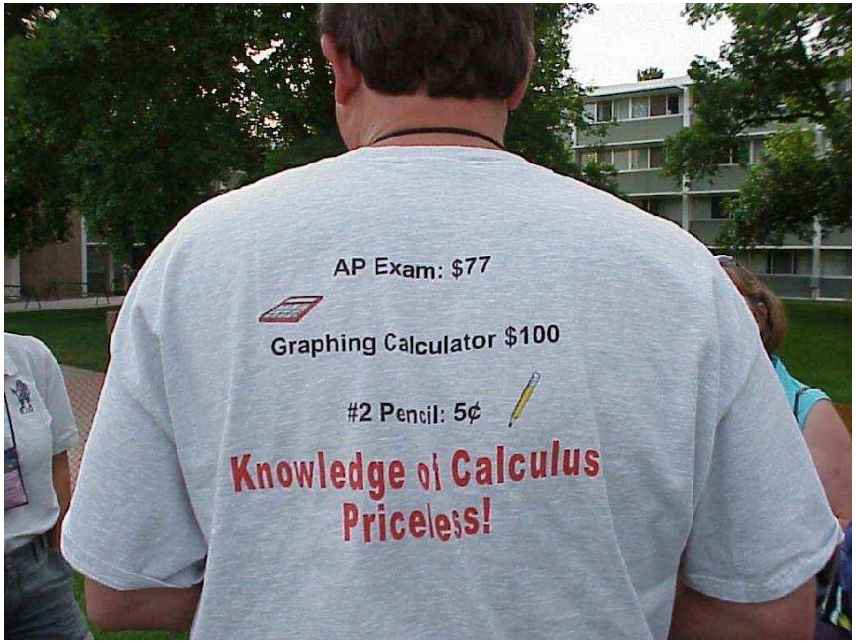
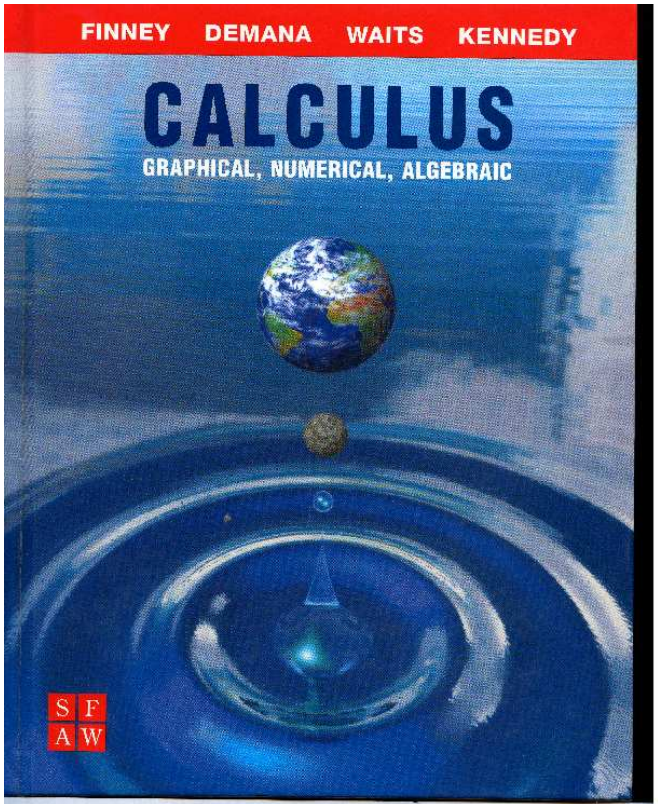
AP Calculus

Review Game

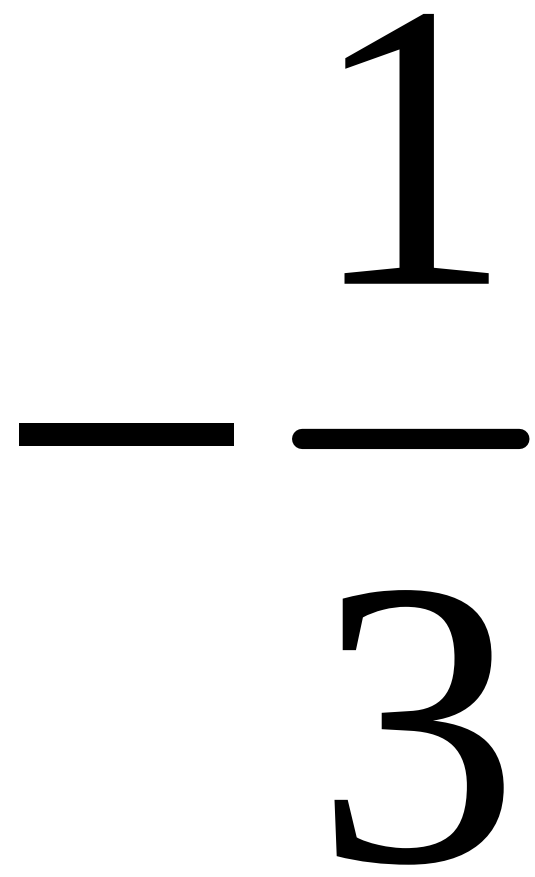




No Calculators!

Evaluate: $\lim_{x\to\infty} \dfrac{\sqrt{x}-4}{4-3\sqrt{x}}$

$\left(\text{same as } \lim_{x\to\infty} \dfrac{x^{1/2}-4}{4-3x^{1/2}}\right)$



If $y = \dfrac{e^{\ln u}}{u}$, find $\dfrac{dy}{du}$ in simplest form.

0

If $y = \sin^3(1-2x)$, find $\dfrac{dy}{dx}$ in simplest form.

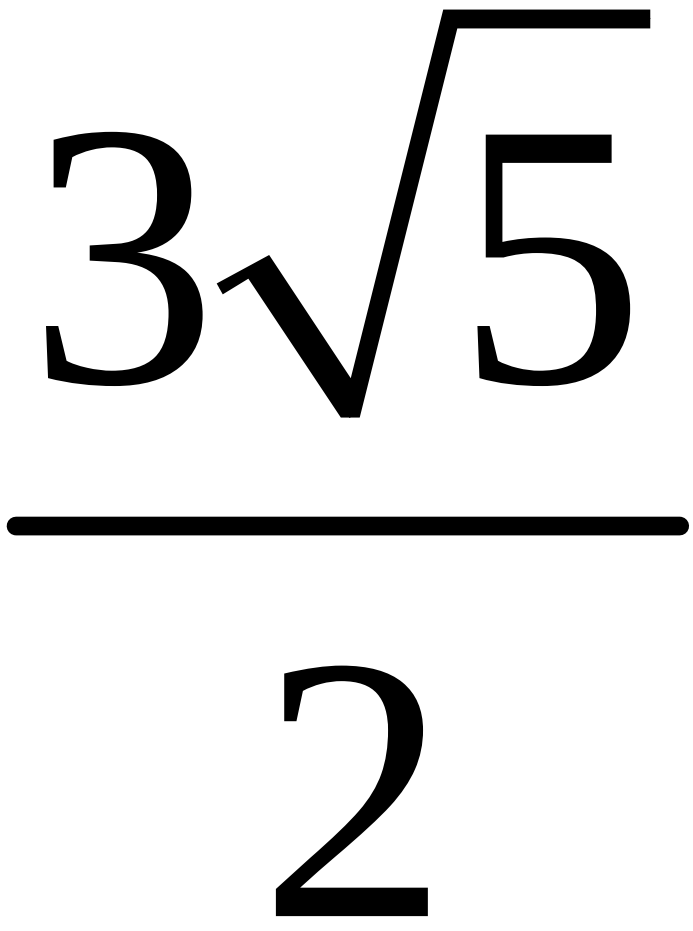
$$-6\sin^2(1-2x)\cos(1-2x)$$

If $y = x^2 e^{1/x}$, find $\dfrac{dy}{dx}$ in simplest form.

$$e^{1/x}(2x-1)$$

A point moves along the curve $y = x^2 + 1$ so that the x-coordinate is increasing at the constant rate of $\frac{3}{2}$ units per second. Find the rate, in units per second at which the distance from the origin is changing when the point has coordinates $(1, 2)$.

Hint: The distance from (x_1, y_1) to (x_2, y_2) is $s = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. So, the distance from (x, y) to $(0, 0)$ is $s = \sqrt{x^2 + y^2} = (x^2 + y^2)^{1/2}$.



Evaluate: $\lim_{h \to 0} \dfrac{\sqrt{25+h}-5}{h}$

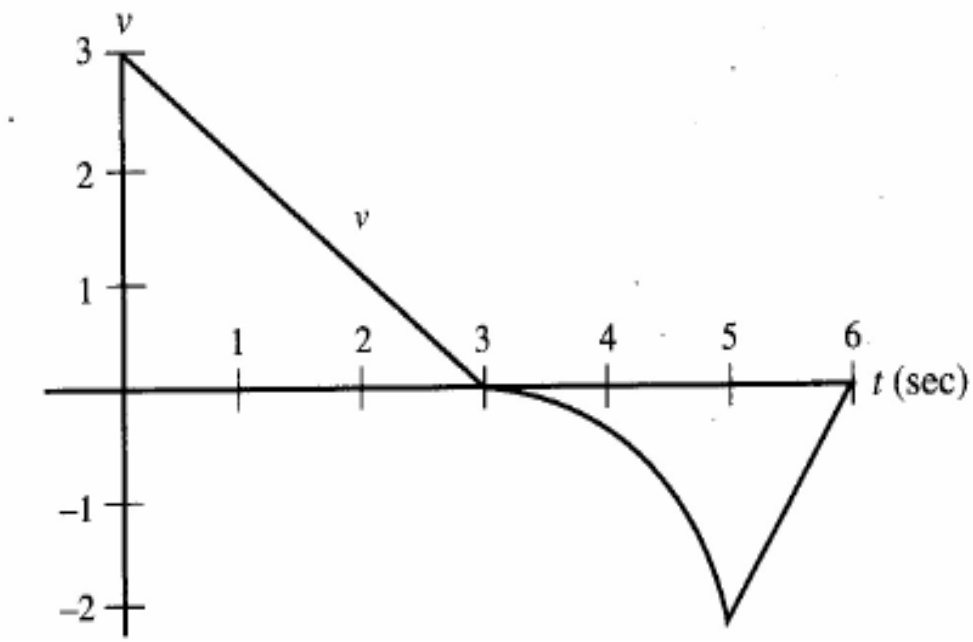
Hint: Use L'Hôpital's Rule.

$$\frac{1}{10}$$

Find the minimum value of $f(x) = x^2 + \frac{2}{x}$

on the interval $\frac{1}{2} \leq x \leq 2$.

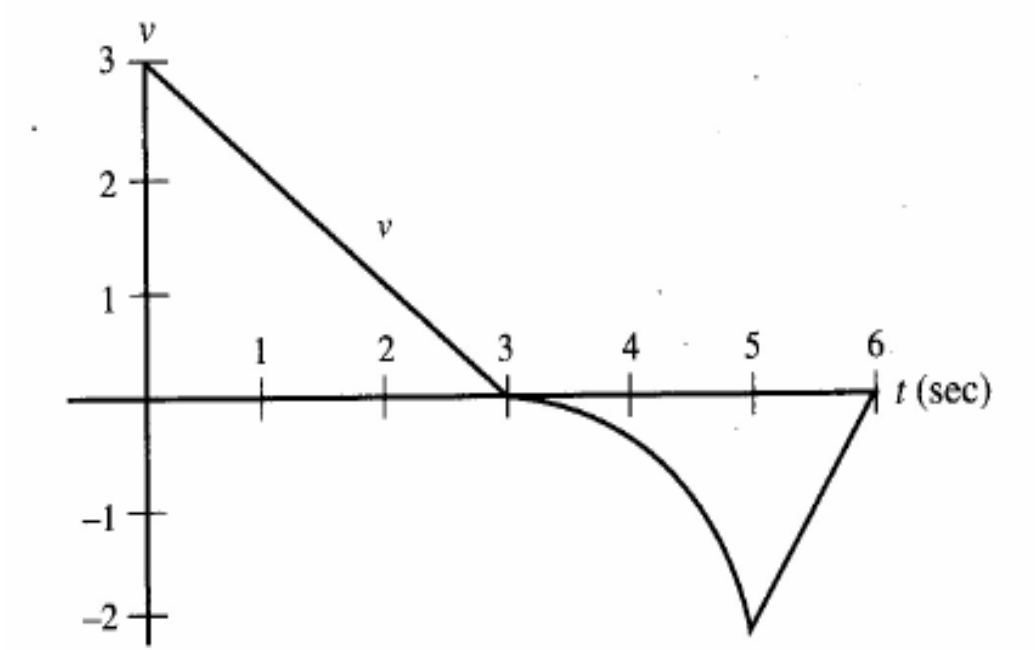
3



The graph above consists of two line segments and a quarter-circle. It shows the velocity of an object during a 6-second interval.

For what value(s) of t between 0 and 6 is the acceleration undefined?

$$t = 3, \quad t = 5$$

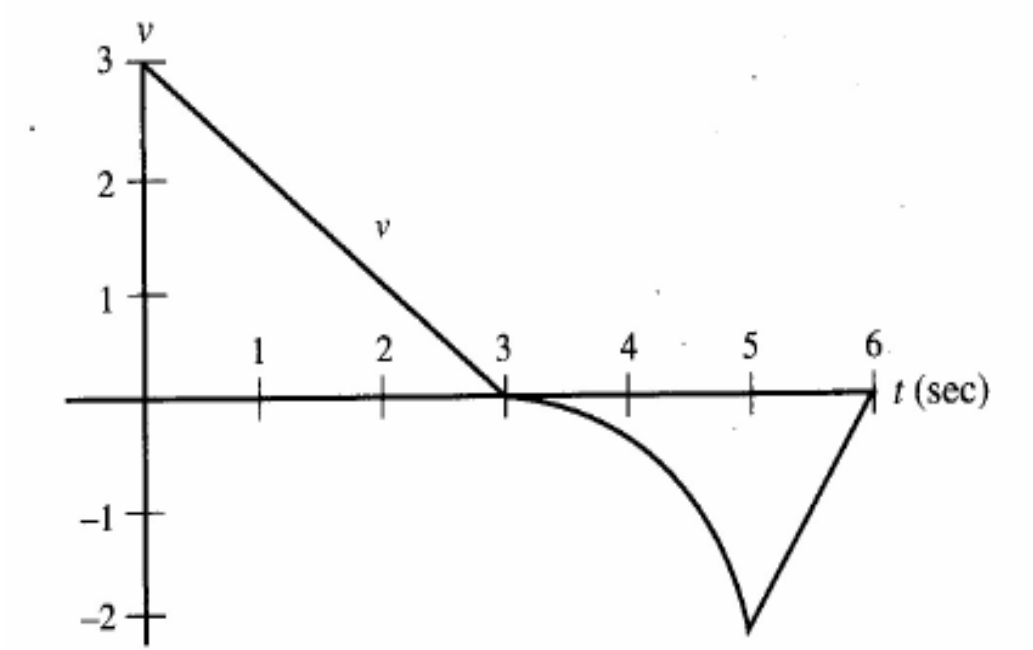


The graph above consists of two line segments and a quarter-circle. It shows the velocity of an object during a 6-second interval.

During what time interval(s) is the speed increasing?

Hint: Speed is the absolute value of the velocity.

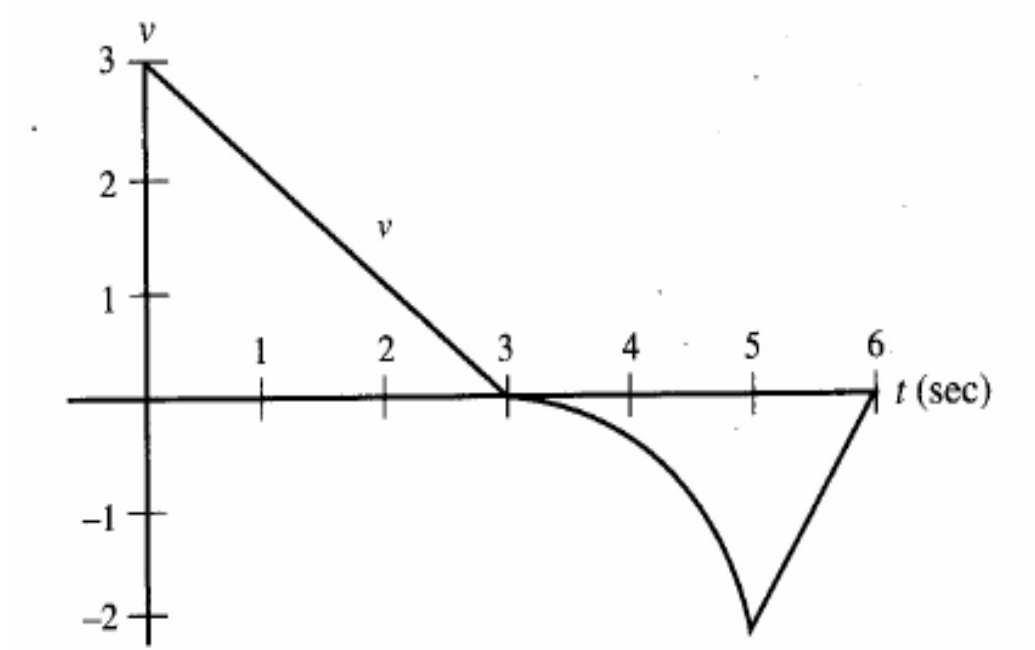
$$3 < t < 5$$



The graph above consists of two line segments and a quarter-circle. It shows the velocity of an object during a 6-second interval.

What is the average acceleration (in units/sec^2) during the first 5 seconds?

$$-1$$



The graph above consists of two line segments and a quarter-circle. It shows the velocity of an object during a 6-second interval.

Find the acceleration at $t = 5\frac{1}{2}$ seconds.

2 units/sec^2

$$f(x)=\begin{cases} x^2 & \text{if } x<-2 \\ 4 & \text{if } -2<x\le 1 \\ 6-x & \text{if } x>1 \end{cases}$$

Which statement is true?

(A) f is discontinuous only at $x=-2$.

(B) f is discontinuous only at $x=1$.

(C) If $f(-2)$ is defined to be 4, then f will be continuous everywhere.

(D) f is continuous everywhere.

(E) f is discontinuous at $x=-2$ and at $x=1$.

(E)

The function $f(x) = x^5 + 3x - 2$ passes through the point $(1, 2)$.

Let f^{-1} denote the inverse of f. Find the value of $\left(f^{-1}\right)'(2)$.

$$\frac{1}{8}$$

If $x^3 + xy - y^2 = 10$, find $\frac{dy}{dx}$.

$$\frac{dy}{dx} = \frac{3x^2 + y}{2y - x}$$

Find the coordinates of the point of inflection of

$f(x) = 2x^3 - 6x^2 + 6x - 1.$

$$(1, 1)$$

If $f(x) = \left(g(x)\right)^5$, $g(2) = -1$,

$f'(2) = 5$, find $g'(2)$.

1

If $y = \dfrac{x+1}{x+2}$, find $\dfrac{dy}{dx}$ in simplest form.

$$\frac{1}{(x+2)^2}$$

What is the instantaneous rate of change of

$$f(x) = \ln\left(\tan^2 x\right) \text{ at } x = \frac{\pi}{4}?$$

4

Find the equation of the line tangent to

$y = \tan^2 x$ at $x = \dfrac{\pi}{3}$.

(Do not simplify.)

$$y-3=8\sqrt{3}\left(x-\frac{\pi}{3}\right)$$

If $f'(x) = 2x(x+1)(x+2)^2$ find the values of x at which $f(x)$ has relative maxima and/or relative minima.

$f(x)$ has relative maximum at $x = -1$ and relative minimum at $x = 0$.